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OSTEOPOROSIS OR BIGHEAD OF THE HORSE.[a]

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Osteoporosis is a general disease of the bones which develops slowly and progressively and is characterized by the absorption of the calcareous or compact bony substance and the formation of enlarged, softened, and porous bone. This fragile and deformed condition is particularly manifest in the bones of the head, causing enlargement and bulging of the face and jaws, thereby giving rise to the terms "bighead" and "swelled head" which are applied to it. The disease affects horses, mules, and asses of all ages, classes, breeds, and of both sexes, but is probably more frequently observed in mature horses and Shetland ponies. The disease is found under all soil, food, and climatic conditions. It may occur in sporadic form, but in certain regions, such as South Africa, Hawaii, and in this country, it seems to be enzootic, several cases usually appearing in the same stable or on the same farm, and numerous animals being affected in the same district.

NAMES APPLIED TO THIS DISEASE.

This affection has been commonly termed bighead, swelled head, or bone softening by horsemen, but it is also known under the more elaborate names of osteoclastia, enzootic ostitis, rarefying ostitis, osteomalacia, fragilitis ossium, and osseous cachexia.

HISTORY.

Very little literature has been presented on this disease, which indicates either that limited attention has been given to it, or that it has been confused with other affections. In Europe the disease appears to be quite rare and is usually described as a form of osteomalacia, a disease which is not uncommon among cattle of that Continent. "Bran disease" of European horses, said to be due to an excessive bran diet, is considered as quite a distinct affection. This latter condition can not be differentiated from the "millet disease" of this country, which is in practically all respects similar to bighead. However, the opinion that bighead is only a form of osteomalacia can not be accepted, nor can the infrequency of the former among horses and the frequency of the latter among other live stock be

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conceded on the argument that has been presented, namely, that the better care which horses receive prevents them from becoming affected. In the Southwest, where osteomalacia, or creeps, has not infrequently been observed by the writer among range cattle, no case of osteoporosis of the horses using the same range has been noted, although the latter animals receive no more care or attention than the cattle.

The appropriate treatment of osteomalacia in cattle is so well known and so effective that if osteoporosis were a similar manifestation of disease a similar line of treatment should prove equally efficacious. This, however, is not the fact. On the other hand, occurrence of osteomalacia on old, worn-out soil, or land deficient in lime salts, or from eating food lacking in these bone-forming substances, or a lime deficiency in the drinking water, is in perfect accord with our knowledge of the disease. But osteoporosis may occur on rich, fertile soil, in the best hygienic stables, and in animals receiving the best of care and of bone-forming foods with a proper amount of mineral salts in the drinking water. Bighead probably occurs more frequently in this country than in Europe, and in certain sections appears in an enzootic form, as it does in Australia, South Africa, India, Madagascar, Hawaii, and the Philippines. In some of these outbreaks in this country that have come under observation the cattle and sheep that have been fed the same hay and grain and stabled in the same barn have not shown the least evidence of osteomalacia. For these reasons osteoporosis is considered as a complete entity entirely independent of osteomalacia.

The disease has been found in this country in all the States bordering the Delaware River and Chesapeake Bay, in the District of Columbia, in some of the New England States, and in many of the Southern States, especially along the coast and in regions of low altitude.

CAUSE.

The cause of this disease still remains obscure, although various theories have been advanced, some entirely erroneous, others more or less plausible, but none of these has been established. Thus faulty feed has been a favorite explanation, but the idea that feeding fodder and cereals poor in mineral salts and grazing in pastures where the soil is poor in lime and phosphates will cause the disease has been easily disproved in many instances. This cause is accepted for osteomalacia in cattle, but not for osteoporosis in horses, since the latter disease is seen on limestone soils, as in New York State, and in animals generously fed on grain and those which are well fed and in good condition, as in many cases in Philadelphia and Washington. Some veterinarians have considered that the disease started as a muscular rheumatism followed by an inflammatory condition of the bones, ter-

minating in osteoporosis, while others have thought it was due to forced or high feeding.

The idea that the disease is contagious has been advanced by many writers, although no causative agent has been isolated. Numerous experiments have been made by inoculating the blood of an affected horse into normal horses, but without results. Also a piece of bone taken by Pearson from a diseased lower jaw of a colt was transplanted into a cavity made for it in the jaw of a normal horse, but without reproducing the disease. Prétone believes that the *Micrococcus nitrificans* causes osteomalacia in man as a result of its producing nitrous acid which absorbs the calcareous tissues. When injected into dogs in pure culture a similar disease is produced. It is probable that if this work is confirmed a similar causative factor will be discovered for osteoporosis.

Elliott considers the disease to be a microbic affection due to climatic conditions, and divides the island of Hawaii into two districts, in one of which the rainfall is 150 inches annually and bighead is very prevalent, while in the other, which is dry and rarely visited by rain, the disease is unknown. Removal of animals from the wet to the dry district is followed by immediate improvement and frequent recovery. In the wet district horses in both good and bad stables take the disease, but in the dry district no unfavorable or unhygienic surroundings produce the affection. As both native and imported horses are equally susceptible, there is no indication of an acquired immunity.

If bighead is a microbic affection—and it certainly has many of the characteristics of an infectious disease—it is probable that the cause is a nitrifying organism which prevents the proper assimilation of the nutrient salts, even though these ingredients are contained in the proper proportion in the food; or these organisms may act directly on the nerves nourishing the bony structures, as the rabies or tetanus virus does on the central nervous system. Theiler has recently stated that his experiments in transfusing blood were negative, and suggests that the cause may only be transmitted by an intermediate host, as in the case of Texas fever. He draws attention to this method of spreading East African coast fever, although blood inoculations are always without result. We know coast fever is infectious, that it can not be transmitted by blood inoculations, but that it occurs with remarkable ease through ticks coming from diseased cattle. That the cause of osteoporosis has not been observed may be accounted for by its being invisible even to the high powers of the microscope.

On some farms and in some stables bighead is quite prevalent, several cases following one after another. On one farm of thoroughbreds in Pennsylvania all the yearling colts and some of the aged

horses were affected during one year, and on a similar farm in Virginia a large proportion of the foals for several years were diseased, although the cows of this farm remained unaffected.

SYMPTOMS.

The commencement of the disease is usually unobserved by the owner, and those symptoms which do develop are generally not well

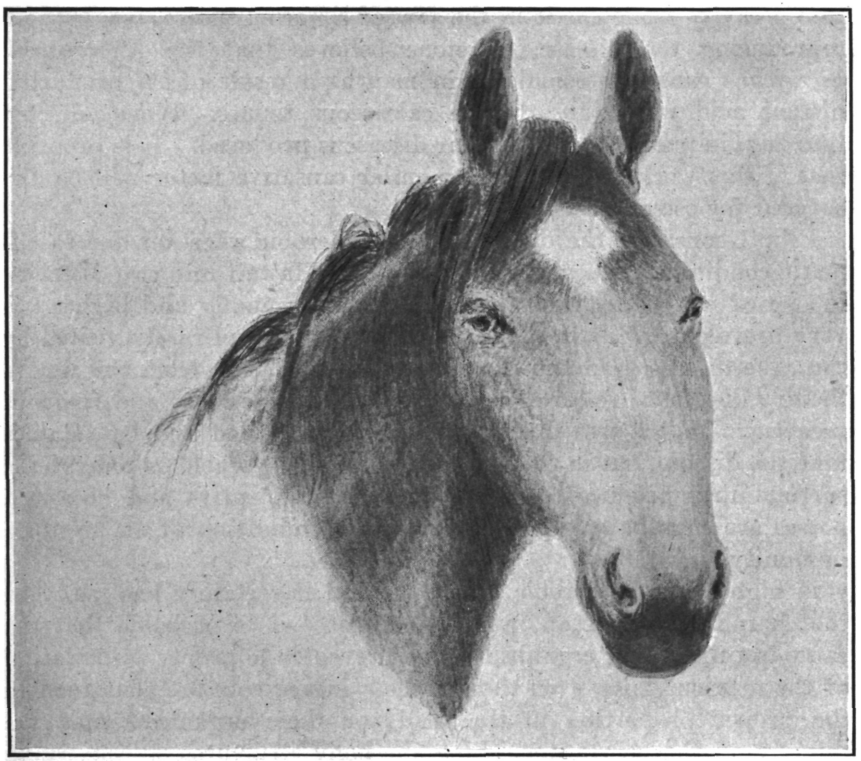

FIG. 1.—Head of osteoporotic horse, with swelling and deformity of facial bones.

marked, or may be misleading unless other cases have appeared in the vicinity. Until the bones become enlarged the symptoms remain

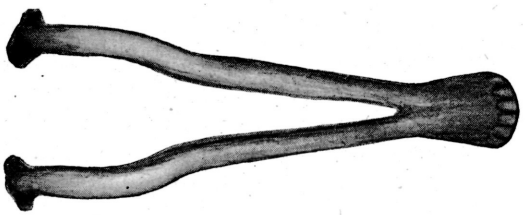

FIG. 2.—Lower jawbone of a normal horse (under view).

so vague as not to be readily diagnosed. The disease may present itself under a variety of symptoms. If the bones of the hock become

affected early in the disease, the animal will first show a hock lameness. If the long bones are involved first, symptoms of rheumatism will be observed, while if the dorsal or lumbar vertebræ are affected indications of a strain of the lumbar region are in evidence.

Probably the first symptom to be noticed is a loss of vitality combined with an irregular appetite or other digestive disturbance and a tendency to stumble while in action. Poor mastication of food

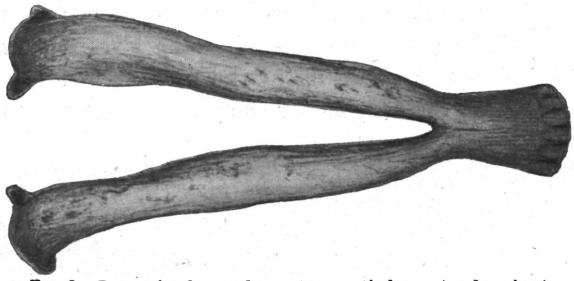

FIG. 3.—Lower jawbone of an osteoporotic horse (under view).

resulting from the early changes in the jawbones may direct attention to the teeth, and a futile attempt is sometimes made to relieve this condition by "floating" the teeth. However, these earlier symptoms may pass unobserved, and the appearance of an intermittent or migratory lameness without any visible lesion to account for it may be the first sign to attract attention. This shifting and indefinite lameness, involving first one leg and then the other, is very suggestive, and is even more important when it is associated with a

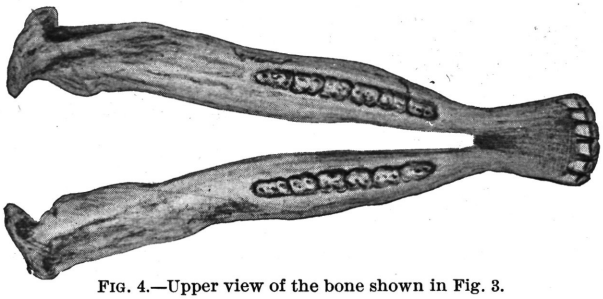

FIG. 4.—Upper view of the bone shown in Fig. 3.

[Note the marked irregularity and enlargement of the bones of the diseased jaw.]

tendency to lie down frequently in the stall and the absence of a desire to get up or the presence of evident pain, stiffness, and difficulty in arising.

About this time, or probably before, swelling of the bones of the face and jaw, which is almost constantly present in this disease, will be observed. (See fig. 1.) The bones of the lower jaw are the most frequently involved, and this condition is readily detected with the fingers by the bulging ridge of the bone outside and along the lower edge of the molar teeth. A thickening of the lower jaw-

bone may likewise be identified by feeling on both sides of the lower border of the jaw and comparing it with the thinness of this bone in a normal horse. (See figs. 2, 3, and 4.) As a result mastication becomes difficult or impossible and the teeth become loose and painful. The imperfect chewing which follows causes balls of food to form which drop out of the mouth into the manger. Similar enlargements of the bones of the upper jaw may be seen, causing a widening of the face and a bulging of the bones about midway between the eyes and the nostrils. The nasal bones also become swollen and deformed, which, together with the bulging of the bones under the eyes, give a good illustration of the reason for the application of the term "big-

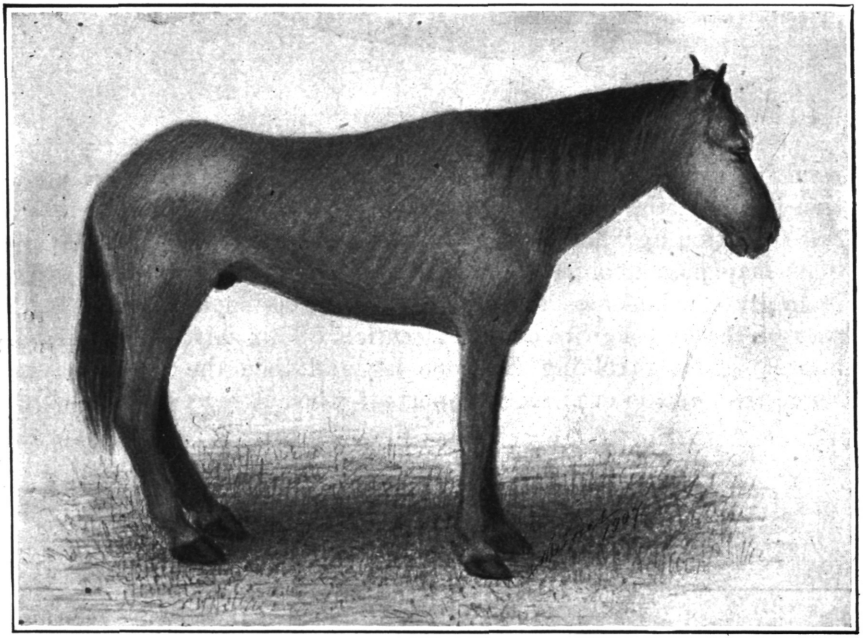

FIG. 5.—Osteoporotic horse.

[Showing enlargement of bones of the head, dropping of the croup, "tucked up" abdomen, and the peculiar position simulating founder.]

head." Other bones of the body will undergo similar changes, but these changes are not so readily noted except by the symptoms they occasion. The alteration of the bones of the spinal column and the limbs, while difficult of observation, is nevertheless indicated by the reluctance of the animal to get up and the desire to remain lying for long periods of time. The animal easily tires, moves less rapidly, and if urged to go faster may have a ligament torn from its bony attachments, or sustain a fracture, especially of the long bones of the leg. An affected horse weighing 1,000 pounds was seen by the writer to fracture its first phalanx from rearing during halter exercise.

The animal becomes poor in flesh, the coat is rough and lusterless, the skin tight and harsh, producing a condition termed "hidebound," with considerable "tucking up" of the abdomen. The horse shows a short, stilted, choppy gait which later becomes stiffer and more restricted, while on standing a position simulating that in founder is assumed, with a noticeable drop to the croup. (See fig. 5.) The animal at this stage usually lies down and remains recumbent for several days at a time. Bedsores frequently appear, and fractures are not uncommon as a result of attempts to arise, which complications in addition to emaciation result in death. The disease may exist in this manner for variable periods, extending from two or three months to two years.

LESIONS.

As has been stated, the bone is the principal tissue involved. The nutrition of the bone is disturbed, as is indicated by the diminished density or rarefaction of the bony substance, the increase in the size or widening of the Haversian canal and the medullary cavity, and the enlargement of the network of spaces in the spongy tissue, the absorptive changes following the course of the Haversian system. In this process of absorption there are formed, within the substance of the bone, areas of erosion, indentations, or hollow spaces of irregular shape. These spaces increase in size and become confluent, causing a honeycombed appearance and an irregular thickening and enlargement of the bone. When fractures occur, no callus forms, but if the ends are left free they rub together and become smooth. The articular and intervertebral cartilages at times become eroded and may disappear, while occasionally either true or false anchylosis takes place. The affected bone may readily be incised with a knife, and the cut surface appears finely porous, resembling some varieties of coral. This porous area is soft, pliable, and yields easily to the pressure of the finger. It has been shown by chemical analysis that the bone of an osteoporotic horse when compared with that of a normal horse shows a reduction in the amount of fat, phosphoric acid, lime, and soda, but a slight increase in organic matter and silicic acid. The bones lose their yellowish-white appearance, becoming gray and brittle. The affected bones may be those of any region or portion of the body, or of the long, short, or middle class of bones. Besides the changes already noted in the bones of the face, the ends of the long bones, such as the ribs, are involved and may be sectioned, though not so readily as the facial bones. The bones of the vertebræ are also frequently involved, necessitating great care in casting a horse, as the writer has seen several cases of broken backs in casting such animals for other operations. The marrow and cancellated tissue of the long bones may contain blood extravasations and soft gelatinous material

or coagulated fibrin. Internal organs are usually normal, but a catarrhal condition of the gastro-intestinal tract may be noted as a result of the improper mastication, resulting from the enlargement of the jaws and soreness of the teeth.

DIAGNOSIS.

The recognition of bighead after the disease has fully developed is not difficult, but in the early stages, when the symptoms are variable and obscure, it is probably frequently mistaken for muscular or articular rheumatism, which is more likely to attack the upper joints of the legs and is found associated with fever.

PROGNOSIS.

The prognosis is uncertain at best, but is more likely to be favorable if treatment and an entire change of feed, water, and location are adopted in the early stages of the disease.

TREATMENT.

The affected animal should be immediately placed under entirely new conditions both as to feed and surroundings. If the horse has been stable fed, it is advisable to turn it out on grass for two or three months, preferably in a higher altitude. If the disease has been contracted while running on pasture, place the animal in a stable or corral in a different locality. In the early stages of the disease beneficial results have followed the supplemental use of lime given in the drinking water. One peck of lime slaked in a cask of water and additional water added from time to time is satisfactory and can be provided at slight expense. This treatment may be supplemented by giving a tablespoonful of powdered bone meal in each feed, with free access to a large piece of rock salt; or the bone meal may be given with four tablespoonfuls of molasses mixed with the feed. Crude calcium phosphate in 2-dram doses three times daily may prove beneficial. Pure phosphorus may also be given in $\frac{1}{4}$-grain doses three times daily in the form of pills in cacao butter. The bowels of the animal should be kept loose, and overloading of the gastro-intestinal tract should be carefully guarded against at all times. Foods containing mineral salts, such as beans, cowpeas, oats, and cotton-seed meal, may prove beneficial in replenishing the bony substance that is being absorbed. The latter is one of the best feeds for this purpose, but it should be fed carefully. In addition to liberal feeding on sound and nutritious grain, supply the best hygienic conditions obtainable, avoiding low, damp pastures as well as basement or damp stables. The animal should not be allowed to work at all during the active stage of the disease, nor should it be used for breeding purposes.